

PTO 07-5620

CC=JP DATE=20030325 KIND=A
PN=15088337

10/747,668

FISH SCALE LIQUID, PRODUCTION METHOD FOR FISH SCALE LIQUID,
PROCESSED FOOD, AND PRODUCTION METHOD FOR PROCESSED FOOD
[Gyorin'eki, Gyorin'eki No Seizo Hoho, Kako Shokuhin
Oyobi Kako Shokuhin No Seizo Hoho]

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UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C.

July 2007

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19):	JP
DOCUMENT NUMBER	(11):	2003088337
DOCUMENT KIND	(12):	A
	(13):	PUBLISHED UNEXAMINED APPLICATION (Kokai)
PUBLICATION DATE	(43):	20030325
PUBLICATION DATE	(45):	
APPLICATION NUMBER	(21):	2001282998
APPLICATION DATE	(22):	20010918
INTERNATIONAL CLASSIFICATION	(51):	A23L 1/325, 1/30
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APPLICANT	(71):	ORGANO CORPORATION
TITLE	(54):	FISH SCALE LIQUID, PRODUCTION METHOD FOR FISH SCALE LIQUID, PROCESSED FOOD, AND PRODUCTION METHOD FOR PROCESSED FOOD
FOREIGN TITLE	[54A]:	Gyorin'eki, Gyorin'eki No Seizo Hoho, Kako Shokuhin, Oyobi Kako Shokuhin No Seizo Hoho

[Claim 1] A fish scale liquid that is acidic water in which fish scales are dissolved or dispersed.

[Claim 2] A process for preparing a fish scale liquid by dissolving or dispersing fish scales in acidic water.

[Claim 3] A process for producing the fish scale liquid stated in Claim 1, wherein the aforesaid acidic water is acidic water having a pH of 5 or lower.

[Claim 4] The process for producing a fish scale liquid stated in Claim 2 or 3, wherein the acid in the aforesaid acidic water is citric acid or phosphoric acid.

[Claim 5] The process for producing a fish scale liquid stated in any one of Claims 2 through 4, wherein fish scales are dissolved or dispersed in an acidic water in the presence of cyclodextrin.

[Claim 6] Processed food that contains the fish scale liquid stated in Claim 1.

[Claim 7] A method for preparing processed food by adding the fish scale liquid stated in Claim 1.

* Number in the margin indicates pagination in the foreign text.

[Detailed Description of the Invention]

[0001] [Technical Field of the Invention]

The present invention pertains to a fish scale liquid, production method for the fish scale liquid, processed food containing the fish scale liquid, and production method for said processed food.

[0002] [Prior Art]

In processing fish caught by fishing, such as sardines and so forth, scales (hereinafter referred to as "fish scales") are generated as byproducts in large quantities. Fish scales generated in fishery processing had been disposed of as industrial wastes for many years due to lack of useful applications. In recent years, however, since fish scales contain collagen, calcium, and the like, they have been drawing attention as another nutrient material and the like.

[0003] As new applications of fish scales, anti-osteoporosis drugs (JP-A-H10-203995), agents for improving the luster of animal coats (JP-A-H10-155428), and so forth are known. As fish scales for food product use, fish scale powders obtained by pulverizing fish scales into a powder form are known.

[0004] Fish scales that are simply powdered, however, do not dissolve in ordinary water; therefore, when fish scale powder is added to water, it ends up precipitating. For this reason, it is difficult to use fish scales for beverages or jelly, and it has not been

possible to effectively utilize the nutritional constituents that fish scales possess.

[0005] Furthermore, fish scales have a distinctive odor (hereinafter referred to as "fish scale odor"), and the amount of fish scales that can be added to food products has been extremely small.

[0006] [Objective that the Invention Intends to Achieve]

The objective that the invention intends to achieve is to provide a fish scale liquid that is prepared from heretofore-discarded fish scales as the raw material, that is readily applicable to food products, and that is odorless and also to provide a production method for it, processed food containing said fish scale liquid, and a production method for said processed food.

[0007] [Means For Solving The Problems]

The present inventor researched extensively to achieve the aforesaid objective and, as a result, learned that fish scales dissolve in acidic water and also that this fish scale solution has a considerably reduced fish odor. Based on these findings, the present invention was achieved.

[0008] That is, the first invention for achieving the aforesaid objective pertains to a fish scale liquid that is acidic water in which fish scales are dissolved or dispersed.

[0009] The second invention for achieving the aforesaid objective pertains to a process for producing a fish scale liquid by dissolving or dispersing fish scales in acidic water.

[0010] The third invention for achieving the aforesaid objective is the aforesaid second invention, in which the aforesaid acidic water is acidic water having a pH of 5 or lower.

[0011] The fourth invention for achieving the aforesaid objective is the aforesaid second or third invention, in which the acid in the aforesaid acidic water is citric acid or phosphoric acid.

[0012] The fifth invention for achieving the aforesaid objective is the aforesaid second to fourth inventions, in which fish scales are dissolved or dispersed in acidic water in the presence of cyclodextrin.

[0013] The sixth invention for achieving the aforesaid objective pertains to processed food that contains the fish scale liquid of the aforesaid first invention.

[0014] The seventh invention for achieving the aforesaid objective pertains to a process for producing processed food by adding the fish scale liquid of the aforesaid first invention.

[0015] [Preferred Mode of the Invention]

No specific limitations are imposed on the type of fish from which the fish scales used in the present invention are obtained as long as they are fish scales that are byproducts of fishery processing, and, some examples of the fish include sardines, saury, and the like,

which are caught in large quantities. The fish scales separated from the fish bodies in fishery processing are washed with water and used as the raw material fish scales.

[0016] In order to produce the fish scale liquid of the present invention, the aforesaid fish scales are dissolved or dispersed in acidic water, but, for the purpose of shortening the dissolving time, it is desirable to pulverize the fish scales by known pulverization means. Examples of the pulverization means include a hammer mill, ball mill, pin mill, jet mill, atomizer, pulverizer, and so forth.

[0017] To produce the fish scale liquid of the present invention, fish scales are added in a concentration of 0.1 to 3 % by weight to acidic water whose pH has been adjusted to 5 or lower, preferably from 4 to 1.5, and agitated, thereby dispersing or dissolving them uniformly. The obtained fish scale liquid has a greatly reduced fish scale odor.

[0018] In the fish scale liquid of the present invention, fish scales are dissolved completely when the concentration of the fish scales is low. When the concentration of the fish scales is high, however, there are some fish scales that cannot be dissolved completely and remain in a dispersed state in the dissolved fish scales, but they do not precipitate.

[0019] No specific limitations are imposed on the acid used for producing the acidic water of the present invention, and any acid that

can be used for food products may be used, some examples of which /3
include organic acids, such as citric acid, lactic acid, malic acid,
and the like, and inorganic acids, such as phosphoric acid,
hydrochloric acid, and the like, of which citric acid or phosphoric
acid is preferably used owing to their strong dissolving and
dispersing power on fish scales.

[0020] The fish scale liquid of the present invention may be
produced by preparing acidic water beforehand and then adding fish
scales to this acidic water, by adding fish scales and an acid
simultaneously, or by dispersing fish scales in water and subsequently
adding an acid therein.

[0021] Furthermore, the concomitant use of cyclodextrin can
improve the deodorization of fish scale odor. Examples of the
cyclodextrin used here include α -cyclodextrin, β -cyclodextrin, and γ -
cyclodextrin.

[0022] Cyclodextrin should be added in a concentration at which
it does not precipitate at ordinary temperature, and the concentration
for α - and γ -types is selected from a range of 10 % or less and 2 % or
less for β -type.

[0023] It has not been elucidated why dissolving fish scales in
acidic water deodorizes fish scales, but the reduction of fish scale
odor by the concomitant use of cyclodextrin is believed to be achieved
by the capturing of odorants inside circular-form cyclodextrin.

[0024] Since the fish scale liquid of the present invention has a dramatically reduced fish scale odor and is a stable solution, it can be applied to various kinds of processed food products. There are no limitations imposed on processed food products to which the fish scale liquid of the present invention can be added as long as they are food products of pH 5 or lower, and some examples include such processed food as juice, energy drinks, soup, jelly, terrines, puddings, mayonnaise, yogurt, jams, snacks, seasonings, and so forth.

[0025] To confect the processed food of the present invention, ingredients, such as sugar, artificial sweeteners, gelling agents, seasonings, colorants, spices, and so forth, for the processed food are selected and used as appropriate according to the type of the processed food.

[0026] To produce the processed food of the present invention, the fish scale liquid of the present invention is added in the production process of the processed food. More specifically, in the case of producing jelly, fish scales are placed and stirred well in water to which an acidic substance, such as citric acid or the like, and cyclodextrin have been added, thereby dissolving the fish scales, and the solution is heated to 60 °C. Separately, a solution is prepared by dissolving a gelling agent and kept at 70 °C, and both solutions are mixed thoroughly. The resulting liquid is filled in containers and sealed and subsequently cooled, thereby obtaining jelly.

[0027] In the case of producing a beverage, fish scales are placed and stirred well in water to which an acidic substance, such as citric acid or the like, and cyclodextrin have been added, thereby dissolving the fish scales, and the solution is heated to 60 °C. To this solution, sugar, spices, colorants, and so forth are added and stirred to homogenize it, and the resulting liquid is packed in containers and sealed, thereby obtaining a beverage.

[0028] [Working Examples]

Working Examples 1 through 5 and Comparative Example 1

According to the compositional ratios shown in Table 1, fish scale powder (product name "Collagetide," a product of Shinda Kanzume Co.), sugar, β -cyclodextrin, and citric acid (or lactic acid) were added in water and heated, thereby preparing a fish scale liquid. This liquid was cooled and subsequently evaluated. The procedures performed were as follows.

<Procedures> 1)

To water, fish scale powder, sugar, citric acid (or lactic acid), and β -cyclodextrin were added.

[0029] 2) The mixture was stirred for 5 minutes at 9000 rpm with a mixer (product name "Clearmix CLM-L2.5S," a product of M Technique Co.)

[0030] 3) The liquid obtained in 2 was heated to 85 °C.

[0031] The liquid obtained in 3 was cooled and subjected to organoleptic evaluation.

<Evaluation criteria>

Dispersibility · Solubility ○: Dispersed or dissolved.

[0032] △: Slight formation of precipitation, which could be dispersed easily with light stirring.

[0033] X: Not completely dispersed and dissolved.

Fish scale odor ○: No odor when compared with the control group.

[0034] △: Slight odor when compared with the control group.

[0035] X: Bad odor when compared with the control group.

[0036] [Table 1]

	対照区	実施例1	実施例2	実施例3	実施例4	実施例5	比較例1
魚鱗粉末(d)	(a)	3 (b)	3 (b)	5 (b)	5 (b)	3 (b)	0.5 (c)
砂糖 (e)	15	15	15	15	15	15	15
クエン酸 (f)	0.36	0.36	0.36	0.36	0.36	—	—
50%乳酸溶液 (g)	—	—	—	—	—	4	—
β-サイクロデキストリン (h)	—	—	2	—	2	2	—
水 (i)	84.64	81.64	79.64	79.64	77.64	76	84.5
合計 (j)	100	100	100	100	100	100	100
pH	3.6	3.8	3.8	3.9	3.9	3.5	6.9
分散・溶解性 (k)	—	○	○	△	△	○	×
魚鱗臭の有無 (l)	—	○	○	△	○	○	×

Key: a) control group b) working example; c) comparative example; d) fish scale powder; e) sugar; f) citric acid; g) 50 % lactic acid solution; h) β-cyclodextrin; i) water; j) total; k) dispersibility · solubility; l) presence or absence of fish scale odor.

[0037] "Dispersibility · Solubility" Working Examples 1 and 2 were 4 completely dispersed and dissolved, and the resulting solutions had a green color.

[0038] Working Examples 3 through 5 precipitated when left standing still, but the precipitate could be dispersed easily with light stirring.

[0039] Comparative Examples 1 and 2 [sic] formed precipitates, and, even when they were stirred, they precipitated again immediately. "Fish scale odor" Working Examples 1, 2, and 4 were compared with the control group and found to have no fish scale odor.

[0040] Working Example 3 had a slight fish scale odor when compared with the control group.

[0041] Comparative Examples 1 and 2 had a definite fish scale odor.

Working Example 6

According to the composition shown in Table 2, citric acid, fish scale powder, sugar, β -cyclodextrin, and gelling agents (gellan gum and xanthan gum) were added to water, and the mixture was heated and then cooled, thereby preparing jelly, which was then evaluated. The procedures performed were as follows.

<Procedures>

1) To half of the water to be used for making jelly were added fish scale powder, sugar, citric acid, and β -cyclodextrin.

[0042] 2) The mixture was stirred for 5 minutes at 9000 rpm with a mixer (product name "Clearmix CLM-L2.5S," a product of M Technique Co.)

[0043] 3) To the remaining half of the water were added gellan gum and xanthan gum, and the mixture was heated to 90 °C.

[0044] 4) The liquids obtained in 1 and 3 were mixed and subsequently cooled, and the resulting product was subjected to organoleptic evaluation in accordance with the method in Working Example 1. The gel strength was measured with "Rheometer CR-200D" (a product of Sun Kagaku Co.) The measurement was taken with a 5 mm-diameter plunger and at a plunger speed of 60 mm/min.

[0045] [Table 2]

	実施例6 (a)
ジェランガム (b)	0.2
キサンタンガム (c)	0.4
魚鱗粉末 (d)	1
砂糖 (e)	15
クエン酸 (f)	0.36
β-サイクロデキストリン (g)	2
水 (h)	81.64
合計 (i)	100
pH	3.8
分散・溶解性 (j)	○
魚鱗臭の有無 (k)	○
ゲル強度 (g/cm ²) (l)	52

Key: a) working example 6; b) gellan gum; c) xanthan gum; d) fish scale powder; e) sugar; f) citric acid; g) β-cyclodextrin; h) water; i) total; j) dispersibility · solubility; k) presence or absence of fish scale odor; l) gel strength.

[0046] In the jelly prepared in Working Example 6, the fish scales were uniformly dispersed, and it did not have a fish scale odor.

[0047] [Effects of the Invention]

The present invention described in Claim 1 provides a fish scale material that can be applied to processed food easily and that has no odor.

[0048] With the inventions described in Claims 2 through 4, it becomes possible to produce a fish scale liquid in which fish scales are dispersed or dissolved uniformly, and the obtained fish scale liquid has a dramatically reduced fish scale odor.

[0049] With the invention described in Claim 5, in addition to the aforesaid effects, the fish scale odor can be further reduced.

[0050] With the invention described in Claim 6 or 7, it becomes possible to provide processed food that effectively utilizes the nutritional constituents of fish scales and also that has a dramatically reduced fish scale odor.